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NATURAL DISASTER REDUCTION: INTERRELATIONSHIPS BETWEEN TECHNOLOGICAL AND NATURAL HAZARDS

Technical session

Addendum

An integrated approach to natural and technological hazard reduction

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1. Field surveys of past earthquakes, floodings, tsunamis, landslides and other natural disasters have clearly shown that the degree of damage and its geographical distribution largely depend upon the site conditions: soil characteristics, geology and topography. Based on these facts, after the catastrophic Peru 1970 earthquake, which left 67,000 victims, microzonation methods and techniques were developed first during the 1970s, improved during the 1980s and updated in the early 1990s. Microzonation studies include all potential natural hazards menacing the area of interest. The area is then divided into sectors of different hazards. The safest sectors are designated for the most important urban components, such as high-density residential zones, and major civil construction projects. To the most hazardous sectors appropriate uses are given, such as open recreational areas. In this way, physical safety is dramatically increased and in most of the cases, construction costs are reduced since development is carried out in harmony with nature and the lessons learned from past disasters.

2. Microzonation was first applied to urban planning for disaster mitigation in the early 1980s and to regional planning in 1986. In 1987, it was applied to the Trifinio regional development planning in Central America. The implementation of Peru's National Programme for Disaster Prevention and Mitigation - PNPDPM - was started in 1989, with the Grau regional model case study. The idea is for the methods developed and the experience gained to be

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applied in Peru's other 11 regions, and the resulting set of regional methods and techniques will combine to form the PNPDPM. This is the country's main activity for the International Decade for Natural Disaster Reduction and the key tool being used in microzonation.

3. As a member of the United Nations disaster mitigation programme in Colombia (1988-1991) and in Peru (1992-1995), the author also addresses technological disasters. In Colombia, one of the eight subprogrammes deals with how to provide rapidly information on poisonous chemicals, and how to handle, transport and store hazardous materials. In one of the other subprogrammes, technological accidents were regarded as secondary effects of a destructive earthquake in Cali, home to two million people. Peru's civil defence programme also includes the organization of an automatic computerized system on technological disasters.

4. In the microzonation investigation of industrial cities and port areas, it is necessary to consider all of the natural hazards threatening the area, and to assess the possible effects of industrial accidents whether triggered by natural hazards or otherwise. By adding an industrial hazard microzonation map to the natural hazard microzonation map, we obtain a natural-technological microzonation map which may be used for disaster mitigation land-use planning in the same way as the present maps are being used. Another useful result of this approach is the drawing up of a combined natural-technological scenario, which is the basis for preparing emergency plans to protect the population.

5. Failure to do this may result in a very hazardous situation. In Callao, Peru's main sea port, large oil, gas and gasoline tanks were well separated from the residential areas some decades ago. Uncontrolled urban expansion has located a large number of dwellings only tens of metres away from those large tanks, in a tsunami inundation zone. Something similar is happening in Tumaco, Colombia, at present. These situations may lead to natural-technological catastrophes.

6. Callao's port and industrial areas for which microzonation investigation was performed a few years back, and which included the defining of the tsunami inundation boundaries and the socio-economic conditions of the 120,000 people living in the most threatened areas, may be a good place to apply the proposed natural-technological integrated method for disaster prevention and mitigation. The results of this model case-study may be very useful to developing countries located in disaster-prone areas, as a means of protecting not only their population but also the investment to be made in the industrial sector for their socio-economic development.

7. On the other hand, the rapid population growth, especially in Third World countries, and the voracious appetite for energy in the industrialized nations greatly increase the human impact on the environment. In addition, technological development creates vast quantities of environmentally harmful products and by-products. By now almost everyone agrees that environmental degradation intensifies disasters. For the effects of urban expansion and the location of important civil works, an investigation of the environmental impact therefore needs to be added to the natural and technological microzonation maps. This is not a new concept; it is one of the main recommendations of the Rio Summit.

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